

STATEWIDE INFORMATION TECHNOLOGY ARCHITECTURE PAPER

Architecture Paper: Conceptual Architecture Principles

Effective Date: May 1, 2007

Approved: Richard B. Clark

Replaces & Supersedes: None

I. Purpose

The purpose of this Conceptual Architecture Principles document is to provide a high-level roadmap and strategic principles to achieve the target enterprise architecture from the baseline architecture.

II. Definition(s)

Refer to the [Statewide Information Technology Policies and Standards Glossary](#) for a complete list of definitions.

III. Closing

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IV. Cross-Reference Guide

A. Architecture Documents

- US Department of Interior Conceptual Architecture

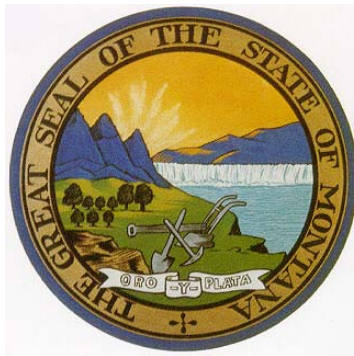
V. Administrative Use

History Log	
Document ID:	ARCH-20070417a
Version:	1.0
Approved Date:	April 30, 2007
Effective Date:	May 1, 2007
Change & Review Contact:	ITpolicy@mt.gov
Review:	Event Review: Any event affecting this architecture paper may initiate a review. Such events may include a change in statute, key staff changes or a request for review or change.
Scheduled Review Date:	Five years from Effective Date
Last Review/Revision:	
Changes:	

State of Montana

ITSD ENTERPRISE ARCHITECTURE

Conceptual Architecture Principles



May 2007

Office of the Chief Information Officer
Department of Administration
Information Technology Services Division

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I. Executive Summary

The Montana Information Technology Act requires that the Department of Administration be responsible for carrying out the planning and program responsibilities for information technology for state government. To meet this requirement the Chief Information Officer (CIO) is creating an Information Technology Services Division (ITSD) Enterprise Architecture (EA). An enterprise architecture is an integrated framework and governance process for managing and evolving IT while meeting strategic and information resource management goals.

To be successful, the architecture must be derived from business requirements and be understood and supported by IT senior management. Information technology does not exist for its own purposes; rather it exists to support the needs of business users. Accordingly, the first major product of the architecture process is the ITSD EA Common Requirements Vision (CRV), published in April 2007. This vision document is intended to ensure that ITSD's IT products and services are aligned with the strategic direction of ITSD. It preceded creation of this document, the Conceptual Architecture Principles (CAP), a logically consistent set of principles that are derived from the business requirements and will be used to guide the engineering of the organization's information systems and technology infrastructure. In essence, the architecture is the foundation necessary for successful growth and development of information technology within ITSD.

The ITSD Architecture Program employs a federated approach to architecture development, focusing exclusively on business processes common to two or more Bureaus or Sections. This approach enables ITSD to focus on common needs while recognizing the responsibility of Bureaus and Sections to manage business processes unique to their individual environments. The ITSD Enterprise Architecture will provide the framework needed to ensure domain architectures are aligned.

Architects can use the CAP to support the migration to target architecture. Use of CAP will enable the implementation of solutions that take into account design (security, quality, and performance) and infrastructure constraints. The CAP provides a high-level roadmap and strategic principles to achieve the target enterprise architecture from the baseline architecture via the transition plan.

The CAP acts as a mechanism to integrate each of the ITSD EA program elements. The CAP shapes how ITSD governance is formed and executed, and how the ITSD EA's target state is envisioned.

Different stakeholders will view and utilize the CAP in different ways with the common end goal of developing cost-effective IT that is aligned with ITSD mission objectives.

ITSD ENTERPRISE ARCHITECTURE
CONCEPTUAL ARCHITECTURE PRINCIPLES

ITSD will develop and institute architectural concepts, tools, and techniques that enable management of the ITSD IT technology in the form of the ITSD EA. The ITSD EA suite comprises the CRV for enterprise requirements, CAP for enterprise principles, and domain architectures. The CAP guides, constrains, and integrates all of these components such that a consistent target state can be communicated throughout the Division and Bureaus.

II. Introduction

Enterprise Architecture (EA) at ITSD will play a major role in improving mission performance and the efficiency of business operations by guiding and constraining the creation of specific domains. Each of the domain architectures will contain a set of initiatives that, in aggregate, and over time, help ITSD transform into an envisioned future. Central to ITSD's success will be the adoption of EA throughout the organization and a cultural perception that EA can help promote line of business interests. One effective measure to begin ingraining EA into the culture is to have a set of overarching architectural principles which all lines of business and IT stakeholders can follow.

These principles are key drivers for ITSD EA stakeholders, as well as for the EA target architecture and associated enterprise services and standards.

Consequently, this document describes these principles and attempts to demonstrate how they impact ITSD as well as provide guidance on how they should influence solution development, and IT infrastructure planning. While this CAP is not necessarily prescriptive, it should guide and constrain IT investment and aid in driving uniform architectural structure and alignment over the long run.

The purpose of this document is to accomplish the following:

- Define the ITSD EA Conceptual Architecture Principles.
- Show how the ITSD EA will relate to ITSD initiatives.

The following sections describe the lineage of the principles, criteria for identifying them, summaries for each principle, and how principles can be applied to derive business value.

III. ITSD Conceptual Architecture Principles (CAP)

The principles are guided by the ITSD Common Requirements Vision (CRV) that represents the embodiment of ITSD strategic objectives into a single high-level set of business and IT requirements. Because these principles represent business and integrate technology direction, the rationale and implications of each principle are drivers and motivating factors for ITSD EA initiatives and priorities. The principles will guide the implementation of technology to meet ITSD-wide requirements, as well as guide decision-making to maximize business benefit and the adaptability of the IT environment. Initiatives aligned with principle implications provide visibility into the business needs of the organization to ensure proper sequencing, as well as to provide insight into dependencies among projects. The development of domain architectures are influenced by the values of the principles – ensuring a consistent and stable set of ideas to be implemented and supported by future initiatives.

A. Effective Principles Criteria

Architectural principles reflect the basic beliefs that shape decisions and guide actions needed to develop and utilize the enterprise architecture in support of the ITSD mission.

There are five (5) criteria that distinguish effective principles. They are:

Criteria	Explanation
<i>Understandable</i>	The underlying tenets of the principles can be quickly grasped and understood by individuals throughout the enterprise. The intention of the principle is clear and unambiguous so that violations, whether intentional or not, are minimized.
<i>Robust</i>	Enforceable policies and standards can be created from the principles. Each set of principles should be sufficiently definitive and precise for deciding a wide range of potentially controversial situations.
<i>Complete</i>	Every potentially important principle governing the management of information and technology for the enterprise has been defined. The principles are applicable to every perceived situation.
<i>Consistent</i>	Every word in a principle statement should be carefully chosen to ensure consistent interpretation. There may be times, however, when strict adherence to one principle may require a loose interpretation of another principle. There must be a balance of interpretations of the principles. Principles should not be contradictory to the point where

adhering to one principle would violate the spirit of another.

Stable Principles should have a "timeless" quality about them, and be able to transcend all foreseeable changes that could occur. The principles for information and technology management need not be changed to keep pace with technology advances.

B. Principle Structure

The CAP considers industry “best practices” in the selection of principles. Based on these principles, specific domains are identified and defined as appropriate for the ITSD environment and as enablers of the implementation of the CAP. In this regard, the CAP is an “actionable” component of the ITSD EA by scoping architecture domains and influencing the selection of standard technologies implemented in each domain. It provides high-level guidance for the selection and utilization of ITSD standard technology tools and platforms.

Adopting the set of principles should initiate a change process in information and technology-related policies and procedures to bring them into conformance with the ITSD EA. Violations of principles in an environment employing enterprise architecture generally lead to operational problems and inhibit the ability of the organization to fulfill its mission. For the purposes of the ITSD EA, the principles will:

- Provide a firm foundation for making architecture and planning decisions.
- Frame policies, standards, and procedures.
- Lead the way to resolving technology conflicts.

The set of principles stand as a guide for accomplishing technology alignment with business requirements. The principles are stated, but more importantly, the rationale for each principle and the implications of their adoption are delineated. Decisions made regarding domain architecture technologies, standards, products, and configurations will be traceable to these principles. The Principles are structured as follows:

- **Principle** — provides a statement of core business value that will guide the decisions and actions of the Division with regard to the selection and use of technology.
- **Principle Rationale** — provides the reasoning behind the adoption of each principle.
- **Principle Implications** — describe impacts and requirements to the architecture and technology environment as a result of principle adoption.

- **Related Technical Architecture Requirements** — provides a tangible link to the Requirements for Technical Architecture (RTA) captured by the ITSD's Common Requirements Vision document.
- **Associated ITSD Initiatives** — lists IT initiatives aligned with Principles. This list should not be construed as exhaustive or complete, but simply demonstrates "architecture in action" by providing tangible examples of ITSD initiatives planned/underway associated with each principle.

IV. Architecture Principles

A. Principle 1: “Actionable” Architecture

The ITSD EA will provide added value when its products and services are used to align the business, integrated to enhance mission performance, and used as a driver to improve process execution.

Rationale:

- The ITSD EA products and services will support ITSD decision-making with specific input from the business.
- The ITSD EA products and services will be integrated into ITSD planning processes, influencing the selection and utilization of technology.
- The ITSD EA will identify business and IT performance improvement opportunities that span the organization, helping to drive down business costs.

Implications:

- IT outputs enable achievement of measurable business outcomes, creating desired results.
- The ITSD EA program must foster collaborative relationships with customers and other partners.
- The ITSD EA program must assess and respond to business needs in a timely manner, obtaining information quickly and rapidly deploying support for business process changes.

Technical Architecture Requirements:

- Support major increases in productive (collaborative) teamwork including emails, file transfers, video/audio links, secure teleconferencing, work flow processes etc. (RTA-11)
- Provide systems that support the creation, tracking, capture in a record keeping system, storage, publication, retrieval and disposition of documents, images and other information rich objects that are used within business processes. (RTA-17)

Associated ITSD Initiatives:

- Implementation of ITIL.

- Continue implementation of MITA.

B. Principle 2: Transformational Strategies

The ITSD EA will provide a roadmap that will facilitate ITSD modernization, creating a line of sight through all aspects of the business in order to achieve success in business transformation.

Rationale:

- The use of sequencing plans will ensure that the results of enterprise architecture analysis activities can successfully achieve desired business performance and operational change.
- The Methodology for Business Transformation (MBT) will provide a consistent method for defining requirements and solution services, so the organization can capture and share similar data.
- The transformational roadmap will align future information technology investments with ITSD's business vision and needs. Current and future business application development, re-usable services, and infrastructure deployments will be aligned to support business change.

Implications:

- Participation of both business and IT personnel are required to ensure that each modernization activity contributes to strengthening the ITSD value position to the customer community.
- Sequencing plans must be understood and supported by senior management and lines of business in order to achieve success.
- Guided by business strategy and drivers, sequencing plans must be articulated in basic business language understood by all those involved in the business and IT decision-making process.
- For consistency, standards evaluation criteria must be developed for mission transformation.
- Business modernization recommendations must include more than just IT initiatives.

Technical Architecture Requirements:

- Provide around-the-clock business operations and an ITSD-wide systems management capability (RTA-8)

- Provide the ability to collect, model, and analyze ITSD's internal and external information across ITSD for decision-making and accountability. (RTA-19)
- Provide strategies for integrating shared data representation, transformation, validation, querying, and administration. (RTA-2)
- Provide a means to deliver interactive training. (RTA-10)

Associated ITSD Initiatives:

- Service Management Project

C. Principle 3: Collaborative Processes

The ITSD EA will promote an environment that emphasizes information sharing and the inclusive participatory rights of customers and stakeholders.

Rationale:

- A collaborative environment will effectively address common requirements in order to meet regulatory requirements and user expectations.
- The establishment of a collaborative environment, with support from a governance structure and management processes, ensures participation of all vested-interest parties, appropriate approval activities, and addresses all views.
- ITSD's management and decision-making will be enhanced if there is collaboration within business, and IT partners.

Implications:

- Success in the future depends on how well the organization manages the collaboration and interaction of all parties.
- Shared vision and principles, with a strategic focus on outcomes, are important to optimize business returns from a collaborative investment.
- Guidelines, communication protocols, and rules-of-engagement must be developed and managed through a cooperative governance model that is responsive to all vested parties' priorities and policies.
- The EA must be followed in order to strengthen the Division's ability to provide a consistent and measurable level of service quality to customers.

Technical Architecture Requirements:

- Enable access and collaboration by interested parties, from multiple locations, via multiple methods and media, to appropriate information. (RTA-3)
- Support, capture, store, and display the interested parties' interactions and how they prefer to interact with ITSD and its partners. (RTA-9)
- Support major increases in productive (collaborative) teamwork including emails, file transfers, video/audio links, secure teleconferencing, work flow processes, etc. (RTA-11)

Associated ITSD Initiatives:

TBD

D. Principle 4: Re-usable Products and Services

The ITSD EA will promote secure, re-usable, and service-oriented solutions. In considering system requirements we should look to reuse existing components before we buy. If no components exist, commercial off the shelf (COTS) solutions should be explored before we build.

Rationale:

- Maximizes investments by capitalizing on reusable services and assets.
- Optimizes the use of business and IT services development resources increasing the return on these investments.
- Facilitates sharing of services, systems, components, and infrastructure within the organization to increase collaboration and information exchange.
- Builds strategic relationships by cooperating and participating in shared initiatives.
- Reduces risk by deploying reusable and shared services that have been designed for interoperability.

Implications:

- Reusable services will require standards for development and use that facilitate interoperability, while supporting Federal Enterprise Architecture Framework (FEAF) principles.
- Procedures for evaluating reusable services, must be established and integrated within; Governance, Change Management, and Configuration Management processes.
- Service agreements to obtain shared or reusable services must adhere to the ITSD EA, particularly where this may impact the buy versus build economics and limit the number of qualifying services.
- Security design considerations for shared services must be given the highest priority during construction and maintenance.
- Changes to reused or shared services will have a broader impact.

Technical Architecture Requirements:

- Provide common application and data interoperability mechanisms to facilitate process interoperability and information exchange. (RTA-4)
- Provide a serviced-oriented integration platform based on an adaptable, flexible architectural framework. (RTA-15)
- Support the development or acquisition of a repository for housing shareable services. (RTA-5)

Associated ITSD Initiatives:

- Re-usable and shareable Geospatial Information Services.
- Service Management Project - Services Catalog.

E. Principle 5: Solutions-focused Approach

The ITSD EA will provide and promote a solutions-focused approach, emphasizing the basic requirement to satisfy business and customer needs as the primary consideration when designing technology solutions.

Rationale:

- Improves customer service and satisfaction.
- Accommodate business needs; strengthening the linkage between the infrastructure and the business process.
- Utilizes a standard solution set that can be quickly assembled.
- Provides greater stability through standard interfaces.
- Allows seamless integration of data resources.

Implications:

- An enterprise solutions development methodology must be developed to ensure consistent application of procedures and standards.
- Each solution requires understanding of the specific business purpose and customer requirements to ensure solutions meet the expectations and needs of the intended business stakeholders.
- Service-oriented integration platform, modularity standards, and evaluation criteria must be developed.

Technical Architecture Requirements:

- Provide a serviced-oriented integration platform based on an adaptable, flexible architectural framework. (RTA-15)
- Provide standard technology interfaces that are easily understood and provide consistent access, look and feel to the underlying service. (RTA-6)
- Provide re-usable service patterns and service components; monitor their ROI through a relevant unit of measure. (RTA-7)

Associated ITSD Initiatives:

TBD

F. Principle 6: Business-driven Planning

The ITSD EA will establish an IT planning foundation based on business priorities. The ITSD IT planning goals and outcomes provide business direction in developing key IT products and services that are defined in the ITSD EA to support the business vision.

Rationale:

- The architecture has the most value when closely aligned with the ITSD strategic direction ensuring that technology investments provide maximum benefit to the Division.
- IT solutions exist to support the needs of the business. Therefore, the ITSD EA must support ITSD's vision, business strategies, plan, and outcomes.
- Business-driven architecture can bridge and shorten the gap between changing business needs and information technology capability.
- Business-driven architecture can provide a shared and common enterprise vision for the evolution of information technology.

Implications:

- Architectural solution choices must be linked to business drivers.
- The sequencing plan methodology must be used to guide alignment of IT with the business strategies.
- The ITSD EA must promote the establishment of joint business and technology direction strategies for business, and IT initiatives.
- The ITSD EA processes must provide business and IT guidance to integrate assessments of major internal and external business drivers and information requirements.

Technical Architecture Requirements:

- Provide the ability to collect, model, and analyze ITSD's internal and external information across ITSD for decision-making and accountability. (RTA-19)
- Enable an increase in the types and quantity of internal business metrics collected, monitored, and analyzed for use by management. (RTA-20)
- Develop a business-driven, solutions-focused architecture as the organization's enterprise architecture, establishing a business and technology blueprint and standards framework. (RTA-16)

Associated ITSD Initiatives:

TBD

G. Principle 7: Modular and Adaptive Development

The ITSD EA will facilitate the development of an IT environment that will be modular and independent in nature. The adaptive EA will enable dynamic capabilities and reconfiguration of the services to respond to business change.

Rationale:

- The architecture has the most value when closely aligned with the ITSD strategic direction.
- Modular and adaptive services provide opportunities to reduce business and IT development costs and time.
- Modular and adaptive services improve the ability of systems to adapt to changing business requirements because the changes will be isolated to affected modules and will be reconfigurable.
- Enables the adaptability of the government's business processes; adding, removing, modifying or reconfiguring services with less complicated procedures.

Implications:

- While life cycle costs will be lower, development costs may be higher, since the analysis and design need to consider generic use cases and implementation of additional requirements.
- The ITSD EA must establish standards and guidelines for developing modular and adaptive solutions.
- The ITSD EA must develop and provide components that are self-contained. The components will be independent of other components: the run-time environment and source of data.
- The ITSD EA must establish planning practices that facilitate understanding of business processes.

Technical Architecture Requirements:

- Provide a serviced-oriented integration platform based on an adaptable, flexible architectural framework. (RTA-15)
- Enable IT integration facilitated through an enterprise-wide, standardized infrastructure including; existing identification, routing, connectivity, and access control functions of our computing environment. (RTA-13)
- Support modular and adaptive solutions, whether leased, purchased or developed internally. (RTA-14)

Associated ITSD Initiatives:

- Service Management Project – Delivery Metrics.

H. Principle 8: Federated Program Management

The ITSD EA program will support the implementation of policy and architecture, accommodating the need for Bureau-unique functionality and business requirements. The ITSD EA program will support a methodology and system of governance that promotes optimal outcomes across a highly diversified set of Bureau mission areas.

Rationale:

- A federated system of governance can optimize outcomes across the enterprise.
- The federated principle guides the implementation of solutions to meet ITSD-wide requirements, as well as guides decision-making to maximize business benefit to each individual Bureau.
- The federated environment and management structure establishes a framework for business and information technology promotes better results.

Implications:

- Bureaus will continue to manage their own business and information technology strategy, development, implementation, and support, but in cross-Bureau initiatives federated principles should apply.
- The ITSD EA must ensure that federated activities of ITSD's business and IT are managed in a way that maintains a cohesive environment.

- Policies for federated governance and management must establish authority and requirements for compliance and participation.
- ITSD governance objectives must be linked to and supported by information management objectives.
- A Governance Risk Management Plan that identifies governance risks and appropriate risk mitigation actions must be developed, implemented, regularly assessed, and updated as needed.
- Enterprise Governance Change Management and Communication Plans to support ITSD governance objectives must be established and monitored.
- The Change Management Plan must be linked to the Risk Management Plan.

Technical Architecture Requirements:

- Enable IT integration facilitated through an enterprise-wide, standardized infrastructure including; existing identification, routing, connectivity, and access control functions of our computing environment. (RTA-13)
- Provide strategies for integrating shared data representation, transformation, validation, querying, and administration. (RTA-2)
- Support the development or acquisition of a repository for housing shareable services. (RTA-5)

ITSD Initiatives:

TBD

I. Principle 9: Information is an asset.

Information is an asset that must be valued to accelerate decision-making, improve management of operations, and increase accountability.

Rationale:

- The value of information is not realized if it is held in isolated pockets.
- Information must be shared to maximize effective decision-making across lines of business and with partners.
- Information is necessary for analysis, modification, and deployment of new activities to accelerate business process cycles.

- Increased access leads to improved integrity and relevance of data.

Implications:

- Must promote interoperable information management, such as data warehouses and data access methods that facilitate information availability for decision-making.
- Information must be structured and standardized for easy access and management, timely availability, and use.
- Metadata (information about the data, such as source, units of measurement, and collection methods, accuracy, and integrity) must be developed, measured, and made available.
- Information management objectives should be linked to ITSD strategic and operational outcome objectives.
- ITSD information management objectives must be linked to and supported by governance activities and objectives.
- Supporting policies regarding security, privacy, confidentiality, information sharing, information integrity, utility, and data relevance must be developed and implemented.

Technical Architecture Requirements:

- Provide the ability to collect, model, and analyze ITSD's internal and external information that needs to be used across ITSD for decision-making and accountability. (RTA-19)
- Provide strategies for integrating shared data representation, transformation, validation, querying, and administration. (RTA-2)
- Provide common application and data interoperability mechanisms to facilitate process interoperability and information exchange. (RTA-4)
- Provide secure access to all computing and information resources for employees. (RTA-12)

Associated ITSD Initiatives:

TBD

J. Principle 10: Data and Information Stewardship

Data and information must be managed and maintained as a stewardship responsibility.

Rationale:

- Like natural resources, data needs stewards who are responsible for its valuation, preservation, security, access, and utilization. In its broadest sense, it is information including items like electronic and paper records, email, etc.
- Data stewards will promote common business rules, which would facilitate information sharing and improve data integrity.

Implications:

- Recognition that all personnel must be responsible for stewardship of the data and the commitment of the resources necessary to make stewardship happen.
- Stewardship includes responsibility for clarification of the data's meaning, content, and reuse.
- Stewardship includes responsibility for managing data's consistency, timeliness, accuracy, and completeness.
- The scope of stewardship must be very sensitive to the sources and uses of the information, ensuring security, confidentiality, and privacy are protected.
- Must develop an Information Assurance Program that will transcend many organizational boundaries and include various levels of stewardship while leveraging and adhering to best business practices and standards.
- Supporting policies regarding security, privacy, confidentiality, information sharing, information integrity, utility, and data relevance must be developed and implemented.
- Training should be developed and provided to support the Information Assurance Program.
- Data stewardship responsibilities and achievements should be reflected in annual individual performance evaluations.
- Recognition of the need to manage "meta" data; that is data "about" the data.

Technical Architecture Requirements:

- Support a shared data, information, and records infrastructure environment that provides flexible access to a consolidated data source. Data will be defined with standard definitions and stored in a common repository that is maintained by data stewards. (RTA-1)

ITSD Initiatives:

TBD

K. Principle 11: Continuity of Operations Planning

An assessment of business continuation and recovery requirements is mandatory when acquiring, developing, enhancing or outsourcing systems. Based on that assessment, appropriate business continuity, disaster recovery, design, testing, and maintenance will take place.

Rationale:

- Customers and partners have heightened awareness of the need for systems availability.
- Any significant visible loss of system availability and stability could negatively impact our mission and legal responsibilities.
- Application systems and data/information are valuable organization assets that must be protected.

Implications:

- Operation and systems plans must be categorized according to business recovery needs.
- Alternate information resource capabilities must be in place.
- Systems must be designed with appropriate level of fault tolerance and recovery in mind.
- Plans for work site recovery must be in place.
- Life cycle and other costs may increase.
- Continuity of Operations Planning (COOP) will require periodic testing and revision.

- Plans for records recovery and alternate data capture mechanisms/processes must be in place.
- Appropriate personnel training/education must be available and in place.

Technical Architecture Requirements:

- Enable the ability to provide around-the-clock critical business operations and an ITSD-wide systems management capability. (RTA-8)
- Provide comprehensive information technology security and privacy mechanisms to ensure compliance with contractual, regulatory, and other information requirements. (RTA-18)

ITSD Initiatives:

TBD

L. Principle 12: Total Cost of Ownership

ITSD will adopt a total cost of ownership model for IT systems that includes life-cycle considerations like the costs of development, implementation/transition, support, disaster recovery, and retirement. In addition the impacts of flexibility, scalability, ease of use, and reduction of integration complexity will be considered.

Rationale:

- Leads to better-informed decisions through an improved understanding of trade offs.
- Enables improved planning and budgeting.

Implications:

- Must develop a total cost of ownership model and educate system sponsors and decision-makers about how to use it.
- Leads to coordinated system replacements, enhancements, and retirements.
- Must apply TCO to portfolio and records management.

- Must provide tools for collection of the actual total cost of ownership.

Technical Architecture Requirements:

- Provide the ability to collect, model, and analyze ITSD's internal and external information across ITSD for decision-making and accountability. (RTA-19)
- Enable an increase in the types and quantity of business metrics collected, monitored, and analyzed for use by management. (RTA-20)
- Provide ITSD-wide systems that support the creation, tracking, capture in a record keeping system, storage, publication, retrieval, and disposition of documents, images, and other information rich objects that are used within business processes. (RTA-17)

ITSD Initiatives:

TBD